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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	09/606,505	Confirmation No. : 7480
Applicant	:	David Black et al.	
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T.C./A.U.	:	2182	
Examiner	:	Mike Nguyen	
Docket No.	:	EMC2-055PUS	
Customer No.	:	022494	

4/13/04

APPEAL BRIEF

(1) Real party in interest.

The real party of interest is EMC Corporation a Massachusetts Corporation haviung a principal place of business in Hopkington, Massachusetts

(2) Related appeals and interferences.

The are no pending patent application currently under appeal which may be related to the subject patent application.

(3) Status of claims.

Claims 1-16 have finally rejected.

(4) Status of amendments. A statement of the status of any amendment filed subsequent to final rejection.

No amendments were filed after the final rejection. All pending claims are originally filed claims.

(5) Summary of invention.

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Reference is made to FIG. 1. A data storage system 10 is shown having a plurality of directors 180_1-180_{32} and 200_1-200_{32}. Messages pass between the directors through message network 260.

Reference is also made to FIGS. 11C through 11G. FIGS. 11C-11E are examples of digital words used by the message network. A destination vector indicates the director, or directors, which are to receive the message. More particularly, a command field, here 32-bytes, eight bytes thereof having a bit representing a corresponding one of the 64 directors to receive the message. For example, referring to FIG. 11C, each of the bit positions 1-64 represents directors 180_1-180_{32}, 200_1-200_{31}, respectively. That is, ***each one of the bits of the mask is associated with a corresponding one of the directors*** . Thus, in this example, because a logic 1 is ***only*** in bit position 1, the eight-byte vector indicates that the destination director is ***only*** front-end director 108_1. In the example in FIG. 11D, because a logic 1 is ***only*** in bit position 2, the eight-byte vector indicates that the destination director is ***only*** front-end director 108_2. In the example in FIG. 11E, because a logic 1 is ***more than one bit*** position, the destination for the message is to ***more than one director***, i.e., a multi-cast message. In the example in FIG. 11E, a logic 1 is ***only*** in bit positions ***2, 3, 63 and 64***. Thus, the eight-byte vector indicates that the destination directors ***are only front-end director 108_2 and 180_3 and back-end directors 200_{31} and 200_{32}.*** That is, ***each one of the bits of the mask is associated with a corresponding one of the directors!***

There is a mask vector which identifies director or directors which may be not available to use (e.g. a defective director or a director not in the system at that time), for a uni-cast transmission). If the director is available by examining the transmit vector mask (FIG. 11F). An example of the mask is shown in FIG. 11F. The mask has 64 bit positions, one for each one of the directors. Thus, as with the destination vectors described above in connection with FIGS. 11C-11E, bit positions 1-64 represents directors 180_1-180_{32}, 200_1-200_{32}, respectively. Here in this example, a logic 1 in a bit position in the mask indicates that the representative director is available and a logic 0 in such bit position indicates that the representative director is not available. Here, in the example shown in FIG. 11F, only director 200_{32} is unavailable. Thus, if the message has a destination vector as indicated in FIG. 11E, the destination vector, after passing through the mask of FIG. 11F modifies the destination vector to that shown in FIG. 11G. Thus, director 200_{32} will not receive the

message. Such mask modification to the destination vector is important because, as will be described, the messages on a multi-cast are sent sequentially and not in parallel. Thus, elimination of message transmission to an unavailable director or directors increases the message transmission efficiency of the system.

Thus, each one of such messages transferred through the messaging network is associated with a descriptor, such descriptor having a command field indicating the one or ones of the directors which are to receive such message, ***such command field having a plurality of bits, each bit being associated with a corresponding one of the directors, one logic state of such bit indicating that such corresponding director is to receive the message and another logic state of such bit indicating that such corresponding director is not to receive such message.***

Further, each one of the directors has a mask stored therein, such mask having a plurality of bits, ***each one of such bits of the mask being associated with a corresponding one of the directors, each one of the bits indicating the an availability or unavailability of the corresponding one of the directors.***

(6) Issues. A concise statement of the issues presented for review.

Whether claims 1-16 are unpatentable over Martin et al. (U. S. Patent No. 5,214,768) in view of Baum et al. (U. S. patent No. 5,166,674).

Whether claims 1, 5, 9 and 13 are obvious over the claims in application no. 09/540,828, 09/539,966 and 09/540,825 in view of Baum et al., (U. S. Patent No. 5,166,674)

(7) Grouping of claims.

Group I: Claims 1, 2, 5, 6, 9, 10, 13, and 14.

Group II: Claims 3, 4,7, 8 11, 12 15, and 16.

The claims in Group I do NOT rise or fall with the claims in Group II.

(8) Argument.

Issue I: Whether claims 1-16 are unpatentable over Martin et al. (U. S. Patent No. 5,214,768) in view of Baum et al. (U. S. patent No. 5,166,674).

The Examiner maintains that the command field of Baum et al. has a plurality of bits, each bit being associated with a corresponding one of the directors, one logic state of such bit indicating that such corresponding directory is to receive the message and another state of such bit indicating the corresponding director is not to receive the message. The Examiner refers to figure 11 and column 11 lines 50-68 and column 12 lines 1-51 of Baum et al.

It is respectfully submitted that Buam et al , does ***not*** describe that the command field of Baum et al. has a plurality of bits, ***each bit being associated with a corresponding one of the directors***, ***one logic state of such bit*** indicating that such corresponding directory is to receive the message ***and another state of such bit*** indicating the corresponding director is not to receive the message.

Referring now to the Baum et al. (U. S. Patent No. 5,166,674), Figure 11 and column 11, lines 50-68 and column 12, lines 1-51. These sections are presented below for convenience:

> The command field (CMD) includes a five bit command that tells the cluster controller and the receiving processing element how to handle the packet. The sequence number field (SEQ) includes an 8 bit packet sequence number sequentially assigned by the originating (source) processing element. The sequence number enables the receiving system to identify which packet number of the total packet count in the message has been received.
>
> The destination address field (DST) includes a fifteen bit destination processing element number. The destination field is used by the switch and cluster controller to self route the packet and by the receiving (destination) processing element to verify that the packet has been routed to the proper address.
>
> The source address field (SRC) includes a fifteen bit originating (source) processing element number. The source field is used by the switch and cluster controller to return the packet to the source in a case where an inoperable or non-present processing element number appears in the destination address field (DST) field, and by the receiving (destination) processing element to properly address any response to the message or command.
>
> The data field (DATA) includes 128 bits of information. The type of information in the data field is defined by the command field (CMD).
>
> The ECC Field (ECC) includes an SEC/DED (Single Error Correct/Double Error Detect) error correction code.

For message header packets, the sequence field specifies the total length of the message, and the DMA controller allocates a message buffer of this length in the PE local memory, writes the initial quadword of data into the message buffer, and sets local hardware pointer, length and sequence registers if there will be more packets of data for this message. It also constructs the message header in memory, which includes the message length, DST id and SRC id.

For message body packets, the sequence number field is checked against the sequence register to verify that packets are arriving in order, and each quadword of data is added to the message buffer. When the message has been completely received it is enqueued on a queue in local memory, known as the IN_QUEUE, for processing by the local processor. If the IN_QUEUE had been empty prior to the addition of this message, then an interruption is generated to the local processor to notify it of pending work.

For storage access command packets, the DMA controller performs the required fetch or store operation to the PE local memory (transferring a doubleword of data), and for fetches a response packet is constructed by reversing the SRC and DST id fields, and then sent on the through the switch to return the requested doubleword of data.

Packets that contain global storage access commands are handled in the cluster controller in the same way that local storage access commands are handled by the DMA controllers. In both cases, the memory operations are autonomous, and include a compare-and-swap capability.

Perhaps and example may be useful. Let us consider a case with four directors, D0, D1, D2 and D3. The address for each one of the four directors may be represented by a two bit word: i.e., the address for director D0 as 00, the address for director D1 as 01, the address for director D3 as 10 and the address for director D3 as 11. It this example, ***each bit is NOT associated with a corresponding one of the directors***, ***one logic state of such bit*** indicating that such corresponding directory is to receive a message ***and another state of such bit*** indicating the corresponding director is not to receive the message. THIS IS NOT THE METHOD USED BY THE APPLICANT.

With applicants invention, using the four director example above, a four bit word is used; one bit being ***associated with a corresponding one of the directors***, ***one logic state of such bit*** indicating that such corresponding directory is to receive a message ***and another state of such bit*** indicating the corresponding director is not to receive the message.

Thus, with applicant's invention, if only director D0 is to receive the message, the four bit word would be 0001, if only director D1 is to receive the message, the four bit word would be 0010, if only director D3 is to receive the message, the four bit word would be 0100, if only director D4 is to receive the message, the four bit word would be 1000, if directors D1 and D3 are to receive the word, the four bit word would be 0110, and if all four directors D1, D2. D3 and D4 are to receive the message, the four bit word would be 1111.

Referring to Baum et al, FIG, 11, the DST is 15 bits for the PE destination number. As stated in Baum et al., "The system of FIG. 6 is a cluster connected network (cluster network) comprising 32 cluster controllers 602(1)-602(32). Each cluster controller provides a system interface for 64 Processing Elements (PEs) 604(1-64), 604(65-128) . . . 604(1985-2048). Each group of one cluster controller and 64 processing elements is referred to as a 'cluster'".

Thus, clearly Baum etr al. has more than 15PEs. Thus, applicant again reiterates that Buam et al , does ***not*** describe that the command field of Baum et al. has a plurality of bits, ***each bit being associated with a corresponding one of the directors, one logic state of such bit*** indicating that such corresponding directory is to receive the message ***and another state of such bit*** indicating the corresponding director is not to receive the message.

That is, the Examiner has ***NOT*** pointed where in Baum et al., "***each one of the bits of the mask is associated with a corresponding one of the directors"***

It is respectfully submitted that the sections in Baum et al., referred to above, provide no description or suggestion of the any one of the following features set forth the claims, below:

Claim 1 points out that:

> such descriptor having a command field indicating the one or ones of the directors which are to receive such message, such command field having a plurality of bits, ***each bit being associated with a corresponding one of the directors, one logic state of such bit indicating that such corresponding director is to receive the message and another logic state of such bit indicating that such corresponding director is not to receive such message*** (emphasis added)

It is respectfully submitted that such feature is not described or suggested in Baum et al.

Claim 3 points out that:

each one of the directors has a mask stored therein, such mask having a plurality of bits, ***each one of such bits of the mask being associated with a corresponding one of the directors, each one of the bits indicating the an availability or unavailability of the corresponding one of the directors.*** (emphasis added)

It is respectfully submitted that such feature is not described or suggested in Baum et al.

Claim 5 points out that:

such command field having a plurality of bits, ***each bit being associated with a corresponding one of the directors, one logic state of such bit indicating that such corresponding director is to receive the message and another logic state of such bit indicating that such corresponding director is not to receive such message.*** (emphasis added)

It is respectfully submitted that such feature is not described or suggested in Baum et al.

Claim 7 points out that:

such mask having a plurality of bits, ***each one of such bits of the mask being associated with a corresponding one of the directors, each one of the bits indicating the an availability or unavailability of the corresponding one of the directors..*** (emphasis added)

It is respectfully submitted that such feature is not described or suggested in Baum et al.

Claim 9 points out that:

each bit being associated with a corresponding one of the directors, one logic state of such bit indicating that such corresponding director is to receive

the message and another logic state of such bit indicating that such corresponding director is not to receive such message. (emphasis added)

It is respectfully submitted that such feature is not described or suggested in Baum et al.

Claim 11 points out that:

wherein each one of the directors has a mask stored therein, such mask having a plurality of bits, ***each one of such bits of the mask being associated with a corresponding one of the directors, each one of the bits indicating the an availability or unavailability of the corresponding one of the directors.*** (emphasis added)

It is respectfully submitted that such feature is not described or suggested in Baum et al.

Claim 13 points out that:

such descriptor having a command field indicating the one or ones of the directors which are to receive such message, such command field having a plurality of bits, ***each bit being associated with a corresponding one of the directors, one logic state of such bit indicating that such corresponding director is to receive the message and another logic state of such bit indicating that such corresponding director is not to receive such message.*** (emphasis added)

In view of the foregoing, it is applicant's position that the claims are patentable over Baum et al.

Claim 15 points out that the method includes:

providing in each one of the directors a mask stored therein, such mask having a plurality of bits, ***each one of such bits of the mask being associated with a corresponding one of the directors, each one of the bits indicating the an availability or unavailability of the corresponding one of the directors.*** (emphasis added)

In view of the foregoing, it is applicant's position that the claims are patentable over Baum et al.

In conclusion, the Examiner has not pointed out where in Baum et al, the ***command field has:***

(1) a plurality of bits, each bit being associated with a corresponding one of the directors; nor where:

(2) one logic state of such bit indicating that such corresponding director is to receive the message and another logic state of such bit indicating that such corresponding director is not to receive such message.

Issue II: Whether claims 1, 5, 9 and 13 are obvious over the claims in application no. 09/540,828, 09/539,966 and 09/540,825 in view of Baum et al., (U. S. Patent No. 5,166,674)

With regard to the provisional double patenting rejection, the Examiner states that "a 'command field' would have been obvious to be included in the system interface in order to indicate whether the directors receive the message or not" and the Examiner refers to Baum et al. discussed above. It is respectfully submitted that such conclusion is not supported by Baum et al. because Baum et al, for the reasons set forth above, makes no such suggestion.

Appendix.

1. (original) A data storage system for transferring data between a host computer/server and a bank of disk drives through a system interface, such system interface comprising:

a plurality of first directors coupled to the host computer/server;

a plurality of second directors coupled to the bank of disk drives;

a data transfer section coupled to the plurality of first directors and second directors;

a messaging network coupled to the plurality of first directors and the plurality of second directors, such first and second directors controlling data transfer between the host computer and the bank of disk drives in response to messages passing between the directors through the messaging network as such data passes through the data transfer section; and

wherein each one of such messages transferred through the messaging network is associated with a descriptor, such descriptor having a command field indicating the one or ones of the directors which are to receive such message, such command field having a plurality of bits, each bit being associated with a corresponding one of the directors, one logic state of such bit indicating that such corresponding director is to receive the message and another logic state of such bit indicating that such corresponding director is not to receive such message.

2. (original) The data storage system recited in claim 1 wherein the message network transmits each message sequentially to a plurality of the directors.

3. (original) The data storage system recited in claim 2 wherein each one of the directors has a mask stored therein, such mask having a plurality of bits, each one of such bits of the mask being associated with a corresponding one of the directors, each one of the bits indicating the an availability or unavailability of the corresponding one of the directors.

4. (original) The data storage system recited in claim 3 wherein the message network compares the command field of a message to be transmitted with the mask and sequentially transmits the message to only those directors which are indicated by the mask as being available.

5. (original) A method for transferring data between a host computer/server and a bank of disk drives through a system interface, such system interface comprising: a plurality of first directors coupled to the host computer/server; a plurality of second directors coupled to the bank of disk drives; a data transfer section coupled to the plurality of first directors and second directors; and a messaging network coupled to the plurality of first directors and the plurality of second directors, such first and second directors controlling data transfer between the host computer and the bank of disk drives in response to messages passing between the directors through the messaging network as such data passes through the data transfer section; such method comprising:

associating with each one of such messages transferred though the message network, a descriptor, such descriptor having a command field indicating the one or ones of the directors which are to receive such message, such command field having a plurality of bits, each bit being associated with a corresponding one of the directors, one logic state of such bit indicating that such corresponding director is to receive the message and another logic state of such bit indicating that such corresponding director is not to receive such message.

6. (original) The method recited in claim 5 including transmitting each message sequentially to a plurality of the directors.

7. (original) The method recited in claim 6 including providing in each one of the directors a mask stored therein, such mask having a plurality of bits, each one of such bits of the mask being associated with a corresponding one of the directors, each one of the bits indicating the an availability or unavailability of the corresponding one of the directors.

8. (original) The data method recited in claim 7 wherein each one of the directors compares the command field for a message to be transmitted with the mask and sequentially transmits the message to only those directors which are indicated by the mask as being available.

9. (original) A data storage system for transferring data between a host computer/server and a bank of disk drives through a system interface, such system interface comprising:

a plurality of first directors coupled to the host computer/server;

a plurality of second directors coupled to the bank of disk drives;

a cache memory;

a data transfer section coupled to the plurality of first directors, the second directors, and the cache memory;

a messaging network coupled to the plurality of first directors and the plurality of second directors, such first and second directors controlling data transfer between the host computer and the bank of disk drives in response to messages passing between the directors through the messaging network as such data passes through the cache memory via the data transfer section; and

wherein each one of such messages transferred through the messaging network is associated with a descriptor, such descriptor having a command field indicating the one or ones of the directors which are to receive such message, such command field having a plurality of bits, each bit being associated with a corresponding one of the directors, one logic state of such bit indicating that such corresponding director is to receive the message and another logic state of such bit indicating that such corresponding director is not to receive such message.

10. (original) The data storage system recited in claim 9 wherein the message network transmits each message sequentially to a plurality of the directors.

11. (original) The data storage system recited in claim 10 wherein each one of the directors has a mask stored therein, such mask having a plurality of bits, each one of such bits of the mask being associated with a corresponding one of the directors, each one of the bits indicating the an availability or unavailability of the corresponding one of the directors.

12. (original) The data storage system recited in claim 11 wherein the message network compares the command field of a message to be transmitted with the mask and

sequentially transmits the message to only those directors which are indicated by the mask as being available.

13. (original) A method for transferring data between a host computer/server and a bank of disk drives through a system interface, such system interface comprising: a plurality of first directors coupled to the host computer/server; a plurality of second directors coupled to the bank of disk drives; a cache memory; a data transfer section coupled to the plurality of first directors, the second directors, and the cache memory; and a messaging network coupled to the plurality of first directors and the plurality of second directors, such first and second directors controlling data transfer between the host computer and the bank of disk drives in response to messages passing between the directors through the messaging network as such data passes through the cache memory via the data transfer section; such method comprising:

associating with each one of such messages transferred though the message network, a descriptor, such descriptor having a command field indicating the one or ones of the directors which are to receive such message, such command field having a plurality of bits, each bit being associated with a corresponding one of the directors, one logic state of such bit indicating that such corresponding director is to receive the message and another logic state of such bit indicating that such corresponding director is not to receive such message.

14. (original) The method recited in claim 13 including transmitting each message sequentially to a plurality of the directors.

15. (original) The method recited in claim 14 including providing in each one of the directors a mask stored therein, such mask having a plurality of bits, each one of such bits of the mask being associated with a corresponding one of the directors, each one of the bits indicating the an availability or unavailability of the corresponding one of the directors.

16. (original) The data method recited in claim 15 wherein each one of the directors compares the command field for a message to be transmitted with the mask and sequentially transmits the message to only those directors which are indicated by the mask as being available.

The Assistant Commissioner is hereby authorized to charge payment of any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-0845.

Respectfully submitted,

Date: 4-1-04

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